REMARKS

In order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention, the claims have been amended in order to state that they are directed to a pre-resin mixture comprising the recited components. No new matter has been added.

Claims 1-3 and 5-9 have been rejected under 35 USC 103(a) as being unpatentable over Takei et al in view of Kumagai. Claims 1-3 and 5-9 also have been rejected under 35 USC 103(a) as being unpatentable over Takei et al in view of Kumagai and further in view of Rasshofer. Claims 1-3 and 5-9 also have been rejected under 35 USC 103(a) as being unpatentable over Takei et al in view of Kumagai, in further view of Rasshofer and further in view of Sato et al. Applicants respectfully traverse these grounds of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a pre-resin mixture which comprises a polyol, a polyisocyanate and a silane coupling agent containing an imidazole group as essential components. The ratio NCO/OH of the number of isocyanate groups in the polyisocyanate to the number of hydroxyl groups in the polyol in the pre-resin mixture is from 0.6 to 4.0 and the weight ratio of the sum of the polyol and the polyisocyanate to the silane coupling agent is from 100:0.01 to 100:10 and the silane coupling agent is the reaction product of a reaction mixture consisting of either an imidazole compound and 3-glycidoxypropyltrimethoxysilane or an imidazole compound and 3-methacryloxypropyltrimethoxysilane and has a hydroxyl group in its molecule when it is obtained by a reaction an imidazole compound and 3-glycidoxypropyltrimethoxysilane and does not have a hydroxyl group in its molecular when it is obtained by a reaction of an imidazole compound and 3-methacryloxypropyltrimethoxysilane.

As discussed previously, the present invention is directed to a pre-resin mixture which can avoid the unpleasant

odor generated when a tertiary amine compound is used as a catalyst during the reaction between a polyol and a polyisocyanate and can provide a resin composition having improved curing and adhesion to metals, inorganic materials and organic materials. In the present invention, the silane coupling agent containing an imidazole group reacts with the polyisocyanate and/or the polyol to form a 3-dimensional network in a resin which enhances the properties of the cured product resin. It is respectfully submitted that the prior art cited by the Examiner does not disclose the presently claimed invention.

The Takei et al reference discloses a process in which a vinyl-based monomer is polymerized in the presence of an alcohol having no addition-polymerization reactivity by using an initiator consisting essentially of peroxide and at least one catalyst selected from the group consisting of an organic sulfonic acid compound having no addition-polymerization reactivity and an inorganic acid. There is no disclosure in this reference regarding the mixing of a silane coupling agent containing an imidazole group with at least one of the polyol and the polyisocyanate prior to the polymerization of the vinyl-based monomer in the presence of the alcohol. In fact, this reference specifically discloses that the reactor does not substantially contain any other component than the named vinyl-based monomer, alcohol, peroxide and catalyst. As such, Applicants respectfully submit that any reference which would suggest the addition of another component other than the specifically named components in Takei et al actually destroys the disclosure of Takei et al and is not properly combinable therewith.

The Kumagai reference is directed to an organosilicon compound which can be used as a surface-treating agent for improving the adhesion of a metal, such as copper, steel or aluminum, or an organic substance, such as glass fibers, silica, aluminum oxide or aluminum hydroxide, to a resin. The organosilicon compound generically disclosed in this reference

does encompass the silane coupling agent containing an imidazole group used in the present invention. Kumagai also does disclose that this organosilicon compound can be used as a resin additive for a thermoplastic or thermosetting resin, with an epoxy resin being specifically exemplified. However, there is no suggestion in this reference regarding the adding of the organosilicon compound disclosed therein to precursor components of a resin composition, let alone a polyurethane resin.

The Rasshofer reference discloses laminates comprising metal and compact or cellular polyurethane resins. This reference has been cited by the Examiner as teaching that 1,2-dimethylimidazole and 2-methylimidazole are known catalysts for urethane forming reactions. However, Applicants readily admit that imidazole compounds have been used at catalysts in urethane-forming reactions as discussed in paragraph [0004] in the present specification. It is also further disclosed that the conventional imidazole compounds were less than completely satisfactory when it comes to adhesion to organic and inorganic materials. As discussed previously, the present invention was arrived at in order to avoid the unpleasant odor generated when using a tertiary amine compound as a catalyst in a reaction of a polyol and a polyisocyanate and to improve the curing and adhesion of a resin composition to metals, inorganic materials and organic materials. As will be disclosed below, there are unexpected benefits associated with using the silane coupling agents of the present invention as compared with conventional imidazole compounds. Evidence establishing this fact will be discussed below.

The Sato reference discloses glass fabrics and a glass-fabric's reinforcing resin laminate sheet which can be used as a printed-circuit board. This reference has been cited by the Examiner as disclosing a finishing agent for the glass fabrics which is the reaction product of an imidazole compound with an amine reactive group and a silane coupling agent and that the

silane coupling agent can comprise γ-glycidoxypropyltrimethoxysilane. This reference also has been cited as teaching that the finishing agent can act simultaneously as a catalyst and a coupling agent. However, the "catalyst" function of this reference means a catalyst in the promotion of a reaction of the functional group of the silane coupling agent and a matrix resin at the glass/resin interface and not a catalyst during the synthesis of the resin. Moreover, the silane coupling agent is applied to the surface of a substrate and the silane coupling agent only exists on the surface thereof. In contrast thereto, the silane coupling agent is incorporated completely in the resin composition of the present invention in order to make it responsible for the curing reaction and results in the composition of the resultant coating film. In the present invention, a notable effect of the coating film adhering to the substrate from the reaction during the process of the curing results and this is clearly unexpected in light of the prior art cited by the Examiner. As such, Sato in combination with the previously discussed references does not teach the presently claimed invention.

As pointed out previously, test data is of record in the present application which is more than sufficient to rebut any proper showing of prima facie obviousness under 35 USC 103(a). As discussed in the previous Response, on pages 8-14 and in Figure 1 of the present specification, objective test data is presented which shows the unexpected benefits gained by using the silane coupling agent containing an imidazole group of the present invention. In Examples 1 and 2 and Comparative Examples 1-4, the curing promotion effect of an imidazole group-containing silane coupling agent of the present invention was evaluated against 3-glycidoxypropyltrimethoxysilane as a common silane coupling agent in Comparative Example 1, 2-ethyl-4-methylimidazole as a conventional imidazole catalyst in Comparative Example 2 and triethylamine in Comparative Example 3. As discussed in

paragraph [0029], in the reaction system in which an imidazole group-containing silane coupling agent was added, the residual isocyanate group content was lower than that of the system to which no catalyst was added.

In Examples 3 and 4 and Comparative Examples 5-11, the contribution of the imidazole group-containing silane coupling agent to the increased adhesion to a base material was evaluated. Examples 3 and 4 use imidazole silane compounds according to the present invention while Comparative Example 5 used 3-glycidoxypropyltrimethoxysilane, Comparative Example 6 used 3-aminopropyltriethoxysilane, Comparative Example 7 used 3-mercaptopropyltrimethoxysilane, Example 8 used 2-ethyl-4-methylimidazole and Comparative Examples 9 and 10 used tertiary amines. As shown in the results contained in Table 1, the imidazole silane compounds of the present invention resulted in the resin composition exhibiting superior adhesion. This is clearly not suggested by the prior art cited by the Examiner.

The corrosion resistance effect of the imidazole group-containing silane coupling agent of the present invention was evaluated in Examples 5 and 6 and Comparative Examples 12-15. In Examples 5 and 6, imidazole silane compounds of the present invention were used while Comparative Example 12 used 3-aminopropyltriethoxysilane, Comparative Example 13 used 2-ethyl-4-methylimidazole and Comparative Example 14 used a tertiary amine. As shown in Table 2, the imidazole silane coupling agents of the present invention resulted in an increased corrosion resistance as compared to the comparative additives while still eliminating the unpleasant odor associated with conventional tertiary amine catalysts. The test results discussed above are clearly sufficient to establish the patentability of the presently claimed invention over the prior art cited by the Examiner.

The currently presented claims have been amended to state that the presently claimed invention is directed to a pre-resin mixture to distinguish over a resin composition per se.

Additionally, Applicants have provided test data that illustrates that the presently claimed silane coupling agent provides unexpected benefits over conventional imidazoles cited in the prior art. As such, it is respectfully submitted that the patentability of the presently claimed invention has clearly been established. The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,

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